TES-A/ISR-M/TEG/TES-N and Network-Centric Grids

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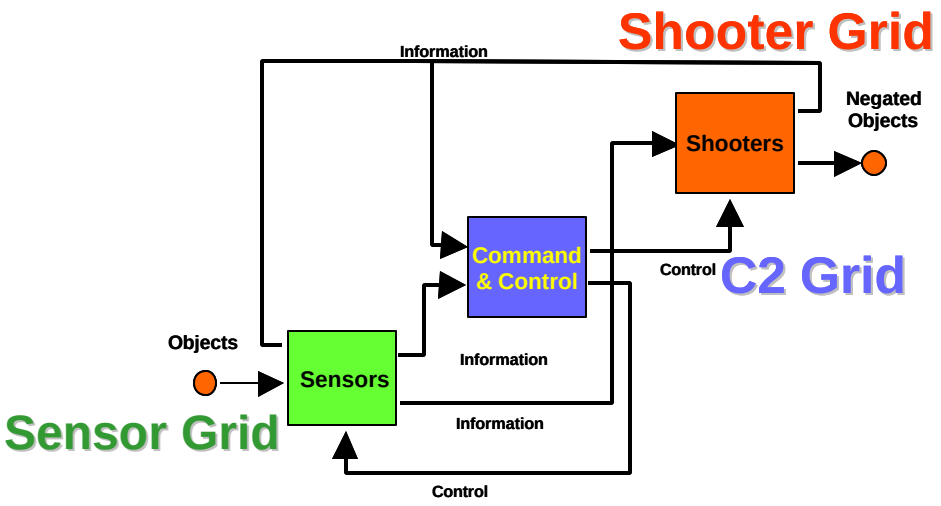
NORTHROP GRUMMAN

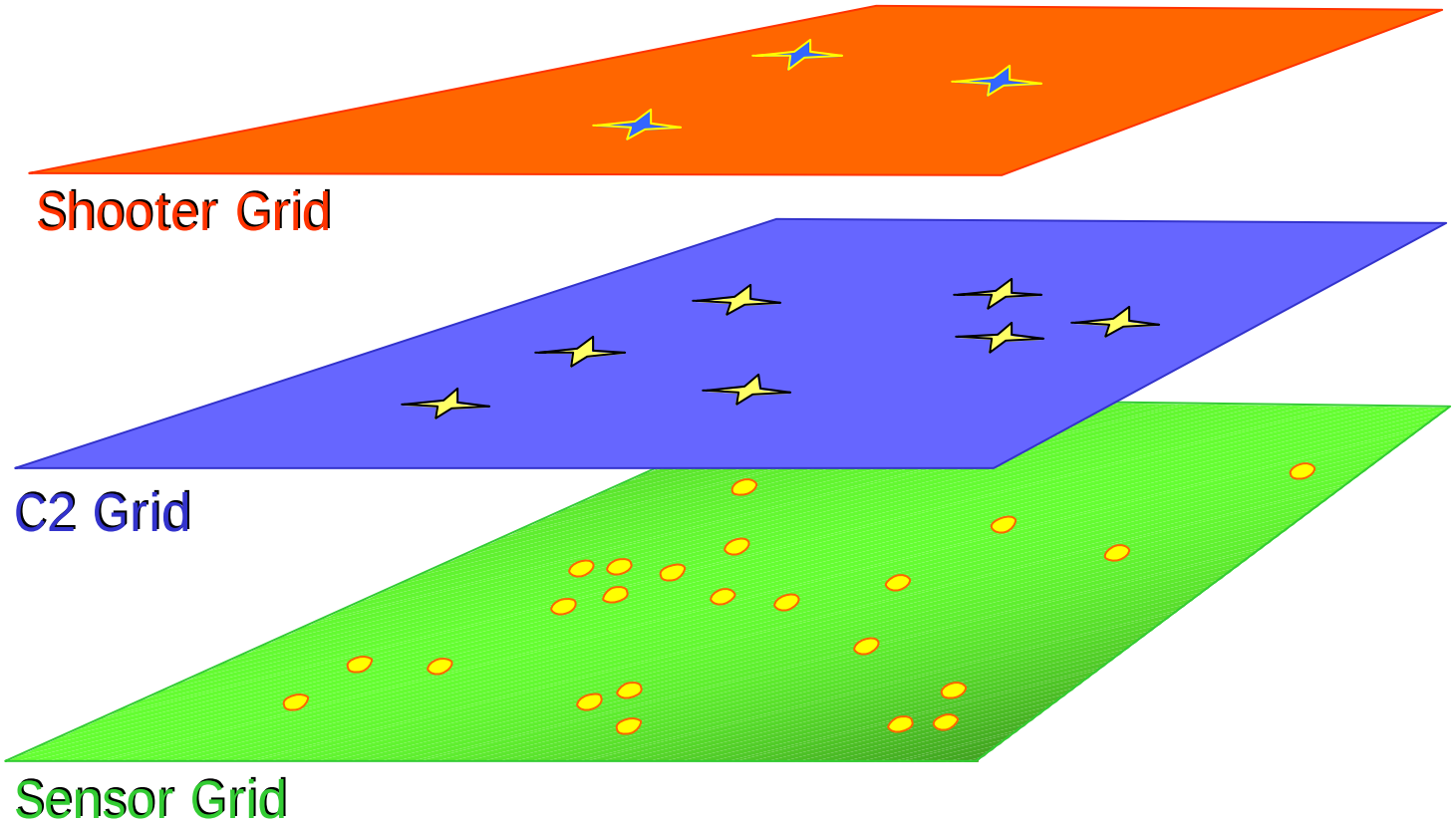
Grids as Interoperability Framework Model



- Sensor – C2 - Engagement — *Cebrowski*
- Sense - Decide – Act — *Stein*
- *Network Centric Warfare* — *Alberts, Garstka, Stein*

Existing Body of Knowledge Available to Support ‘Grids’ as an Framework Model for Interoperability

The Grids…



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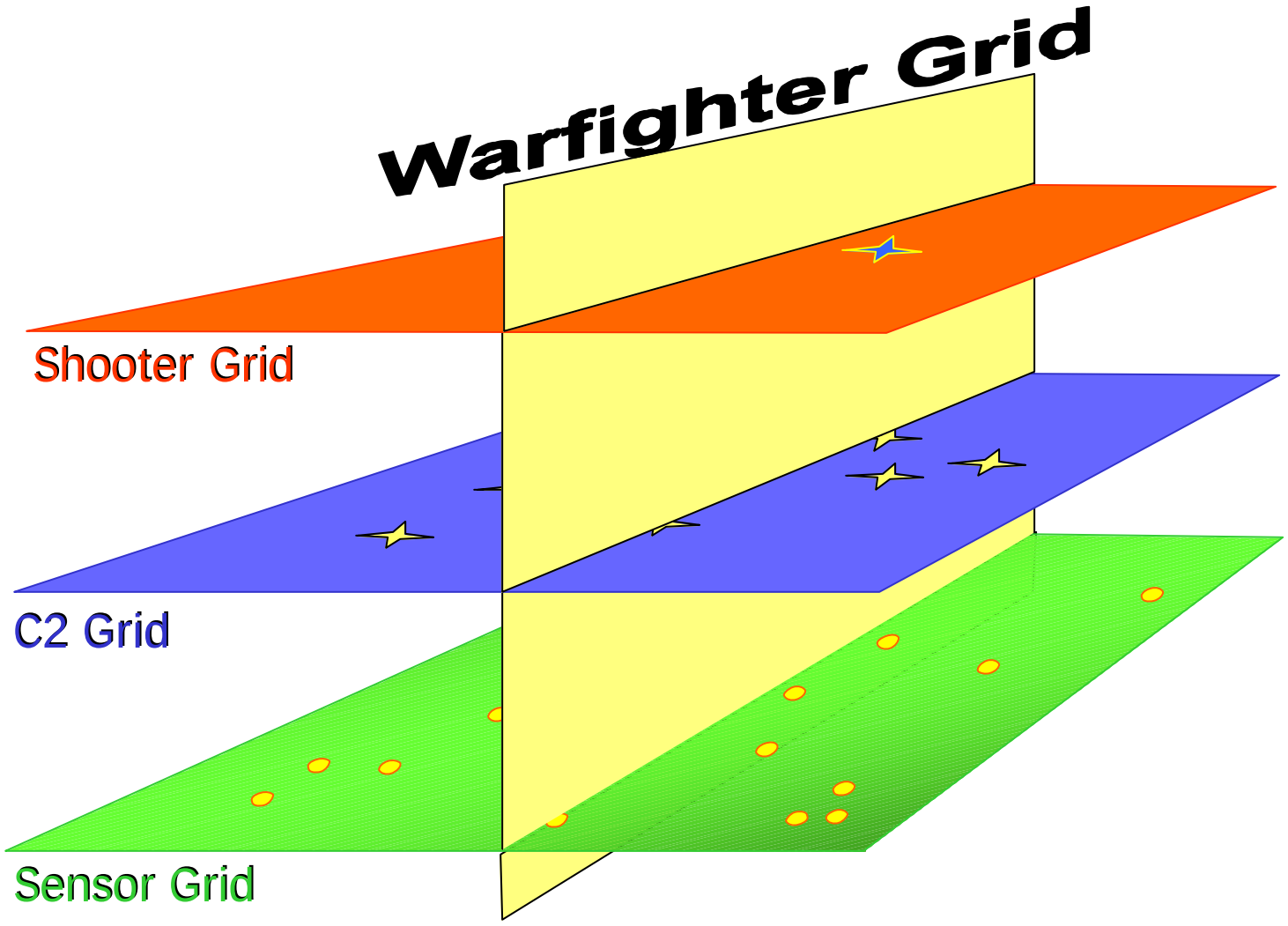
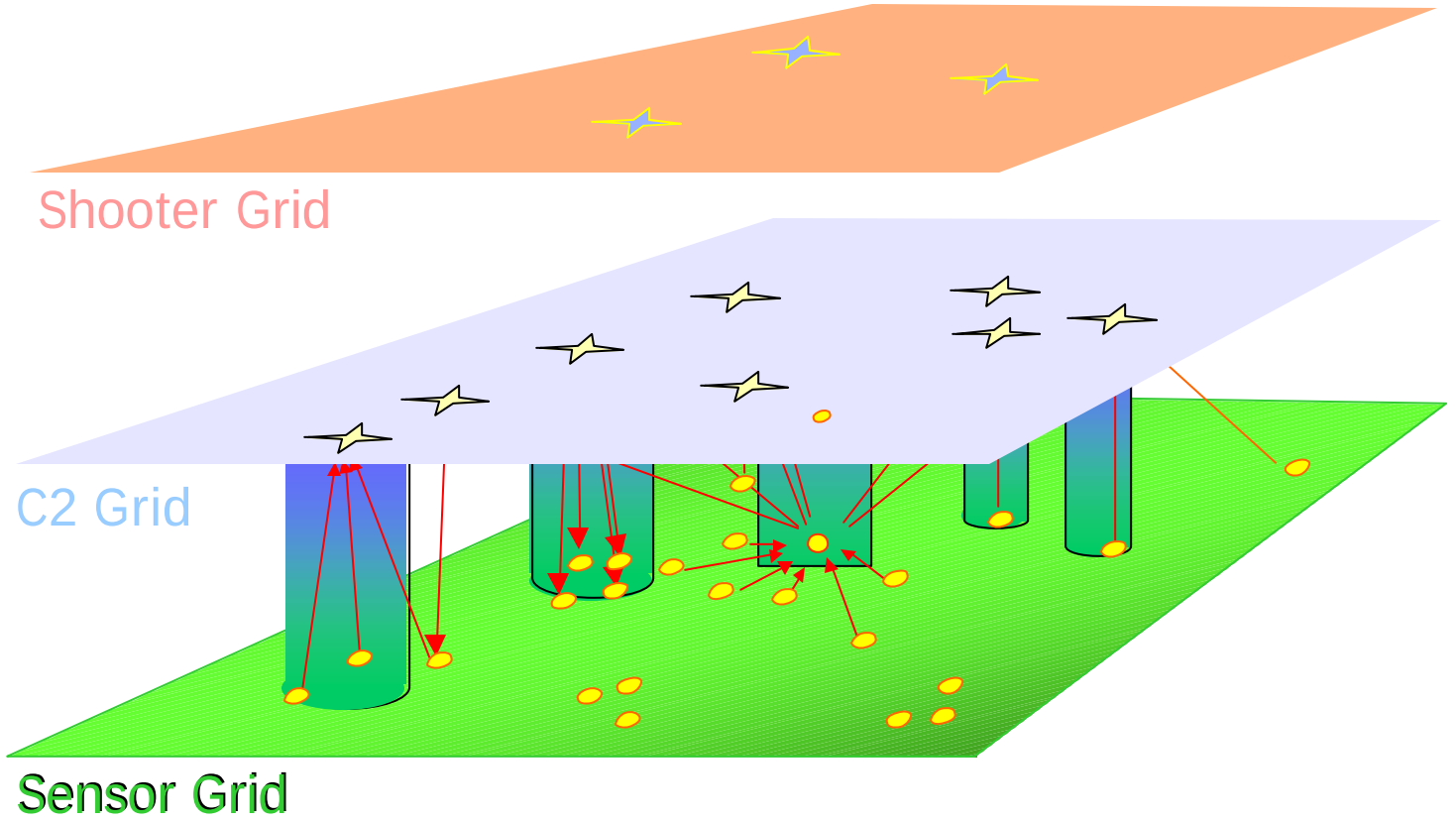


Grids As Interoperability Framework

- Define Objective (Network-Centric) CONOPS
  - Time-Sensitive Targeting
  - Collaborative Joint Operations
- Define the Linkages Within each Grid
  - Increase Performance
  - Provide Robustness
  - Synchronize Operations
  - Enable Network-Centric Behavior and ‘Virtual Assets’
- Define the Linkages Between Grids
  - Enable Flexible Mission-Tailored Operational ‘Threads’
  - Provide Multiple Paths for Robust Architecture
- Migration Roadmap for Existing / Emerging Systems

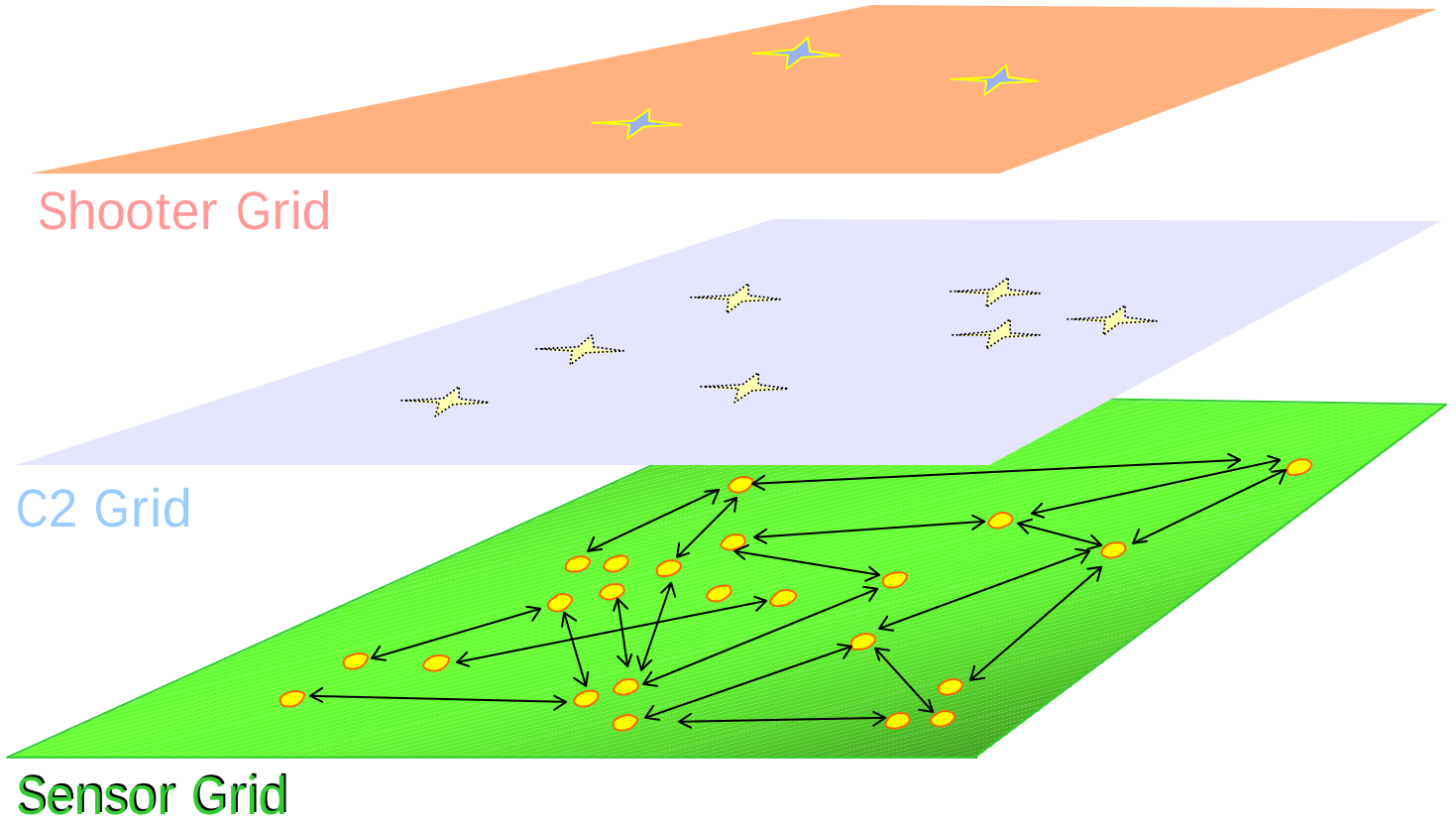
Yesterday's Sensor Grid



- Single-INT Stovepipes
- Sensor/C2 Stovepipes (Sensor Platform with dedicated C2 Node)
- One Way Broadcast

Overlapped & Fragmented Sensor Pictures at the C2 Grid

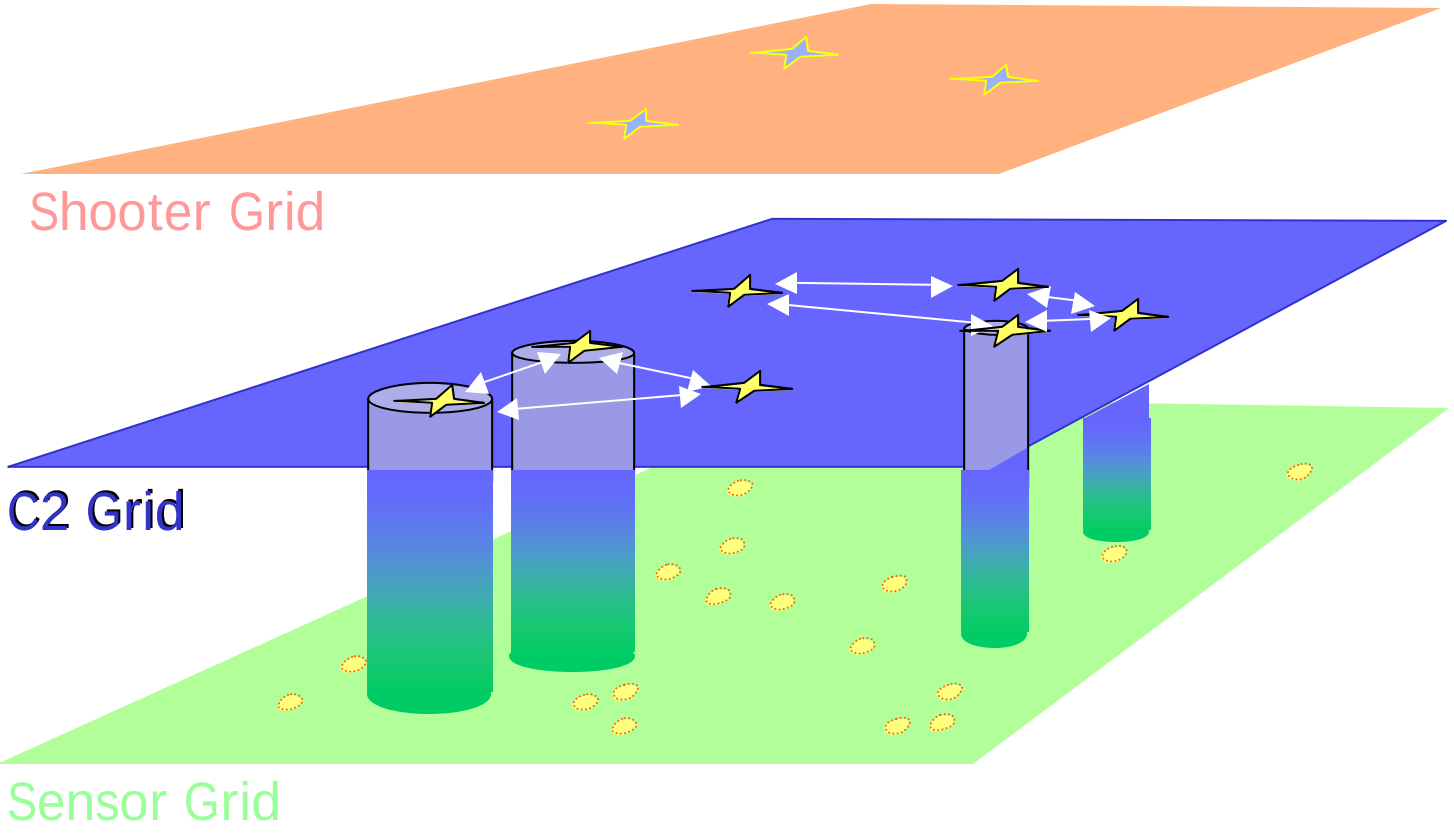
Tomorrow's Sensor Grid



- Correlates and Fuses Wide Range of Disparate Sensors and Data
- Manages Uncertainty, Transforms Data into Information, Nominates to C2
- Standards include CIG/SS, DCGS, ...

Real-Time Integrated Sensor Picture

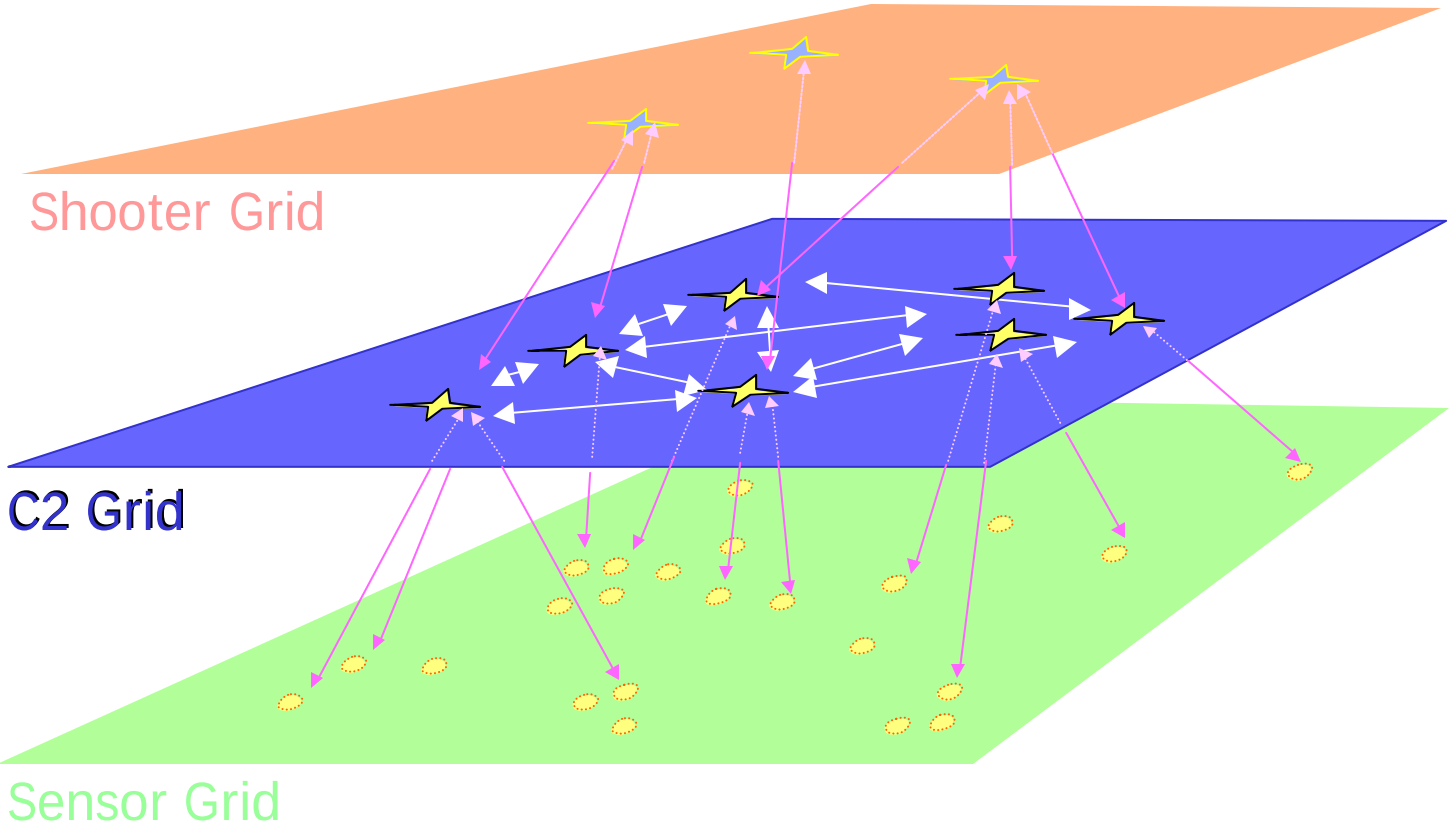
Yesterday's C2 Grid



C2 Grid

- Networked Nodes and Distributed COP, But Ineffective Linkages Across Services' C2 Systems
- Lack of Timely & Flexible Tasking of Sensor Grid
- Legacy C2-Sensor Stovepipes Confuse C2 & Sensor Grids Progress

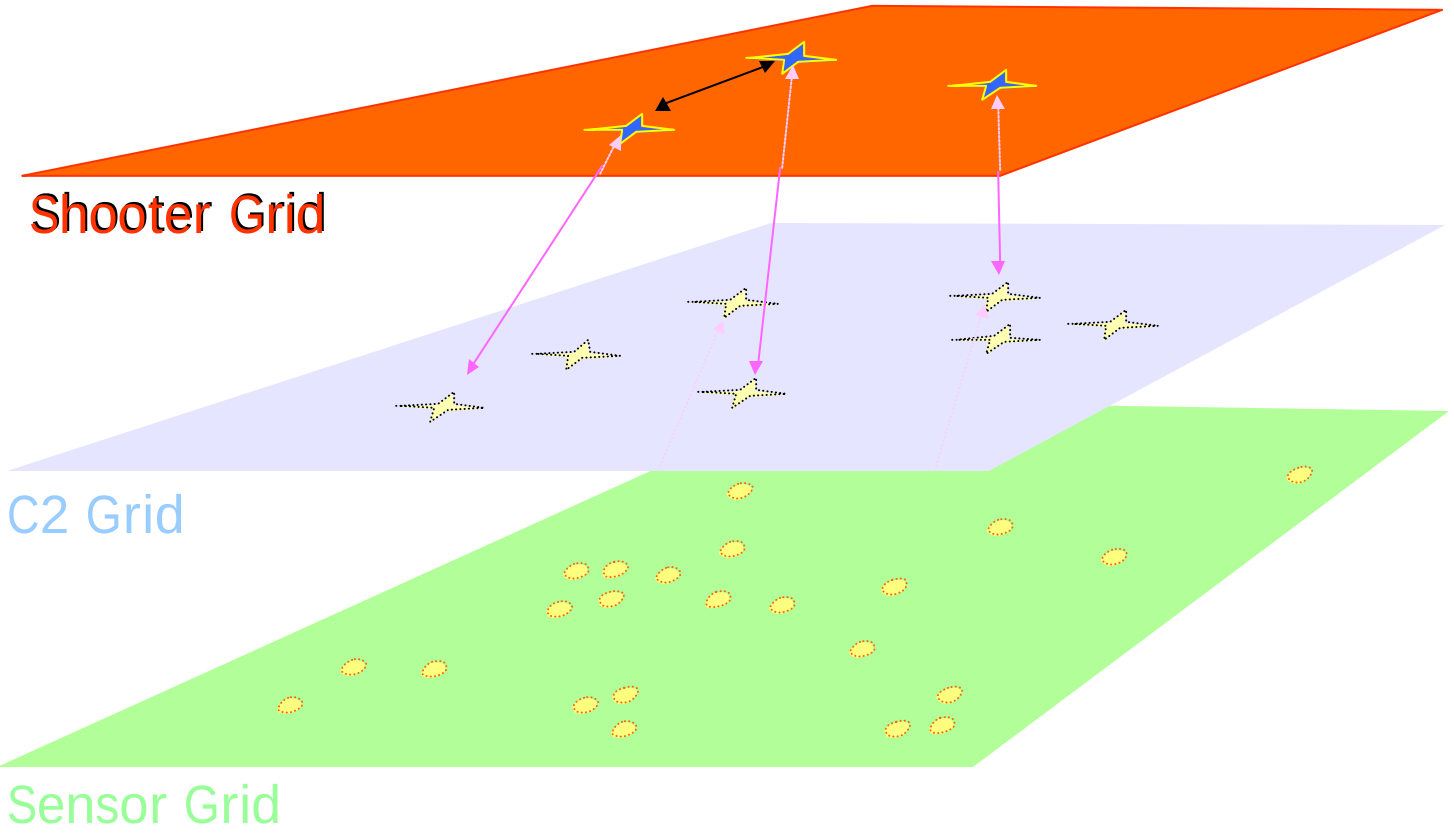
Tomorrow's C2 Grid



C2 Grid

- Distributed Synchronization & Interoperability Across C2 Grid
- Mission Tasking (Commander's Intent) to Sensor and Shooter Grids
- C2 Reviews Nominations from Sensor Grid and Assign Actions to Shooter(s)
- Standards include DCGS, …

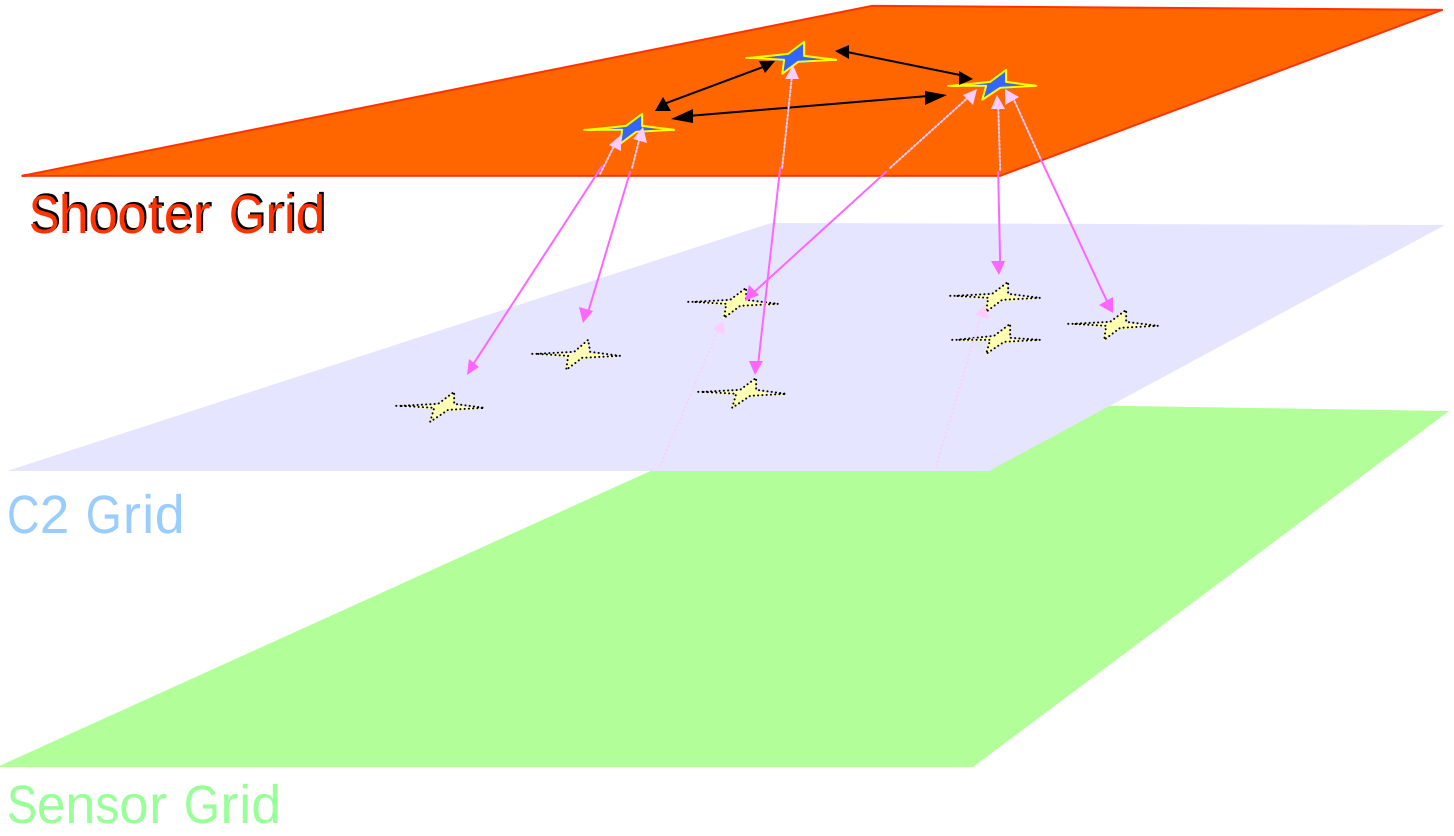
Yesterday's Shooter grid



Shooter Grid

- Limited Networking Between Shooters
- Limited Networking Between C2 and Shooters
- Lack-off Real-time Precision Targeting Data

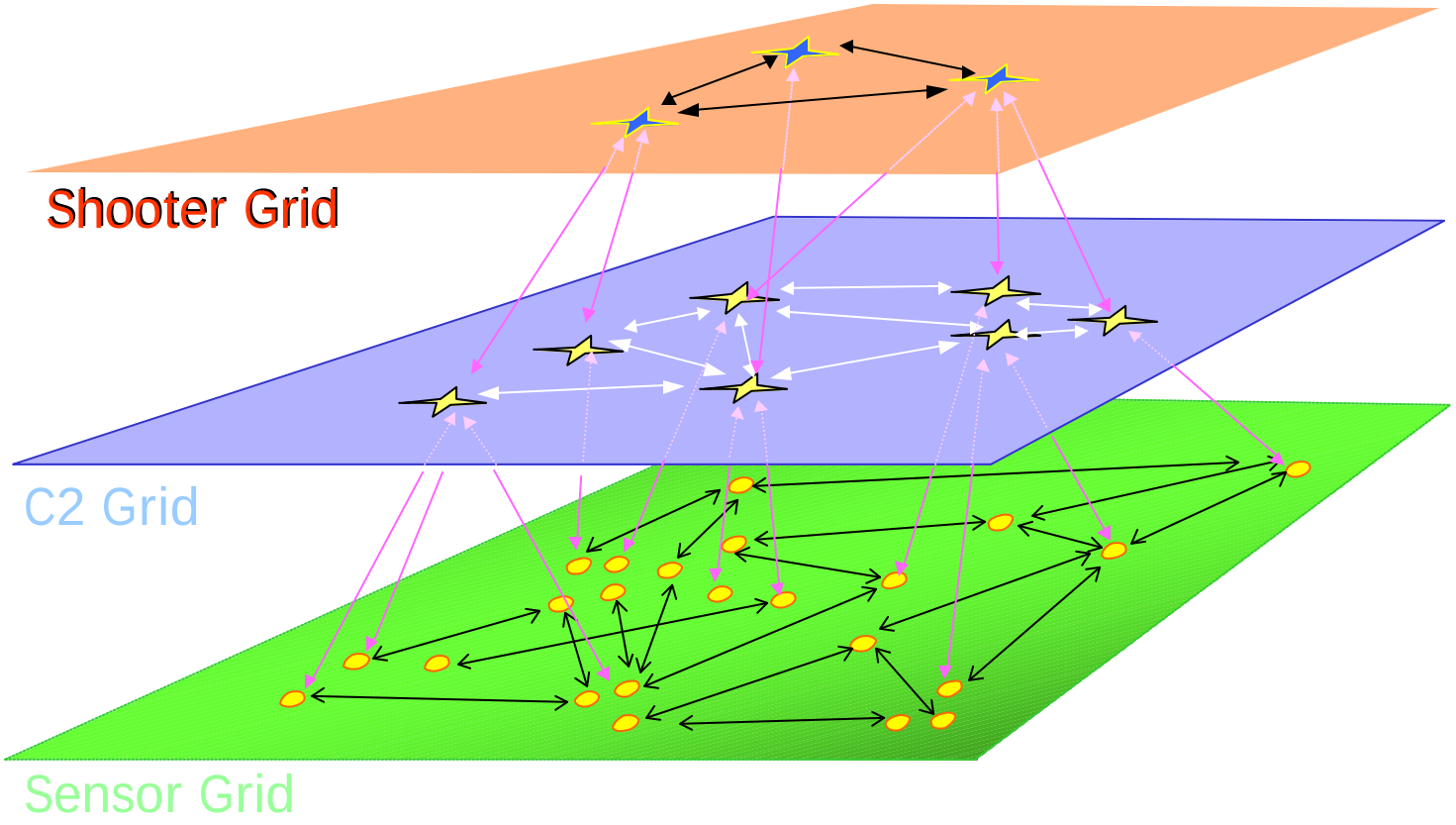
Tomorrow's Shooter Grid



Shooter Grid

- Platform/Weapon-Specific Response to C2 Tasking
- Guaranteed (…deterministic, accurate, precise, …) Effects
- Real-time Sensor-to-Shooter Data (via C2 Grid) for Time Sensitive Targeting

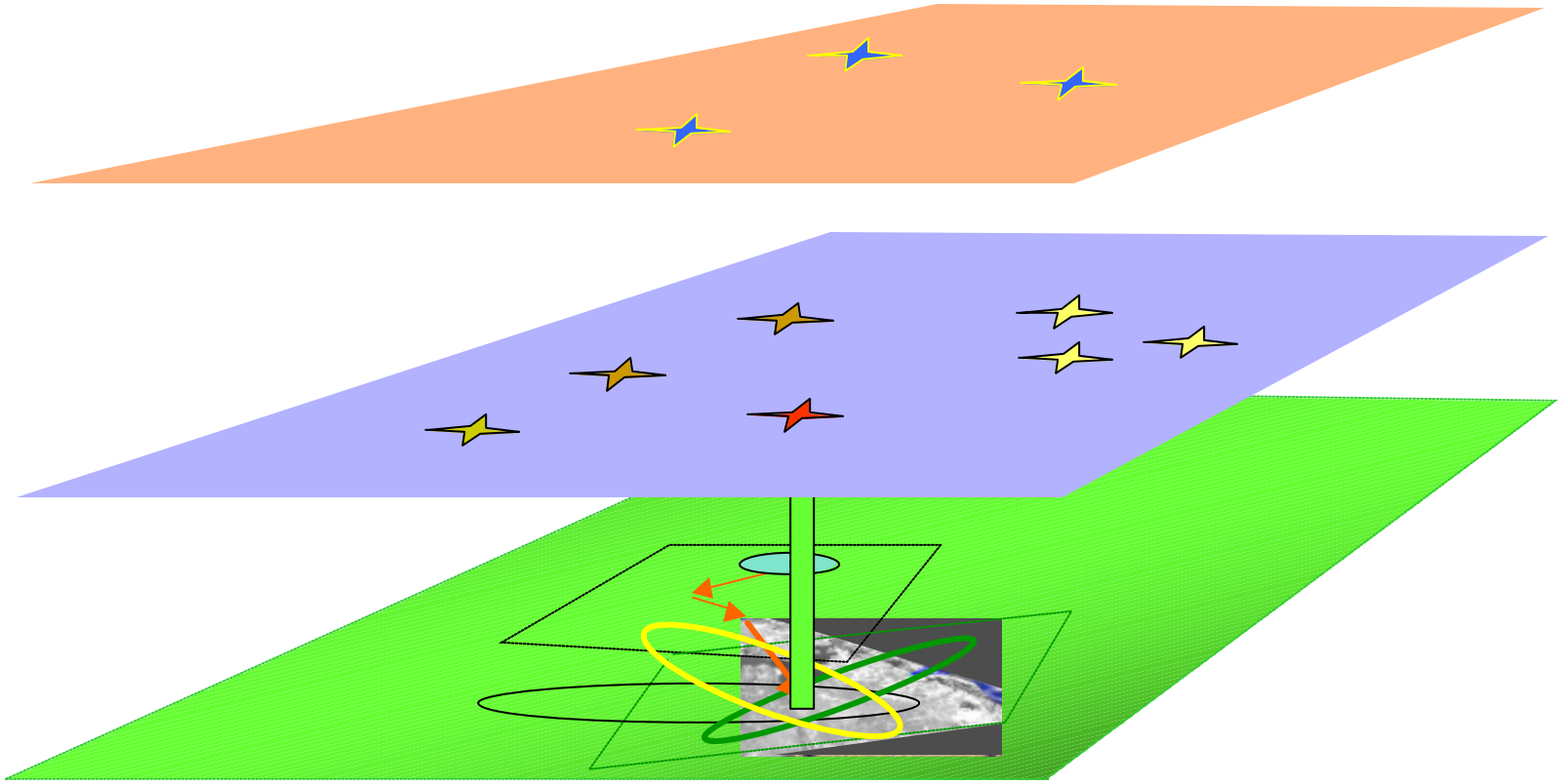
Objective Grids



Network-Centric Interoperability

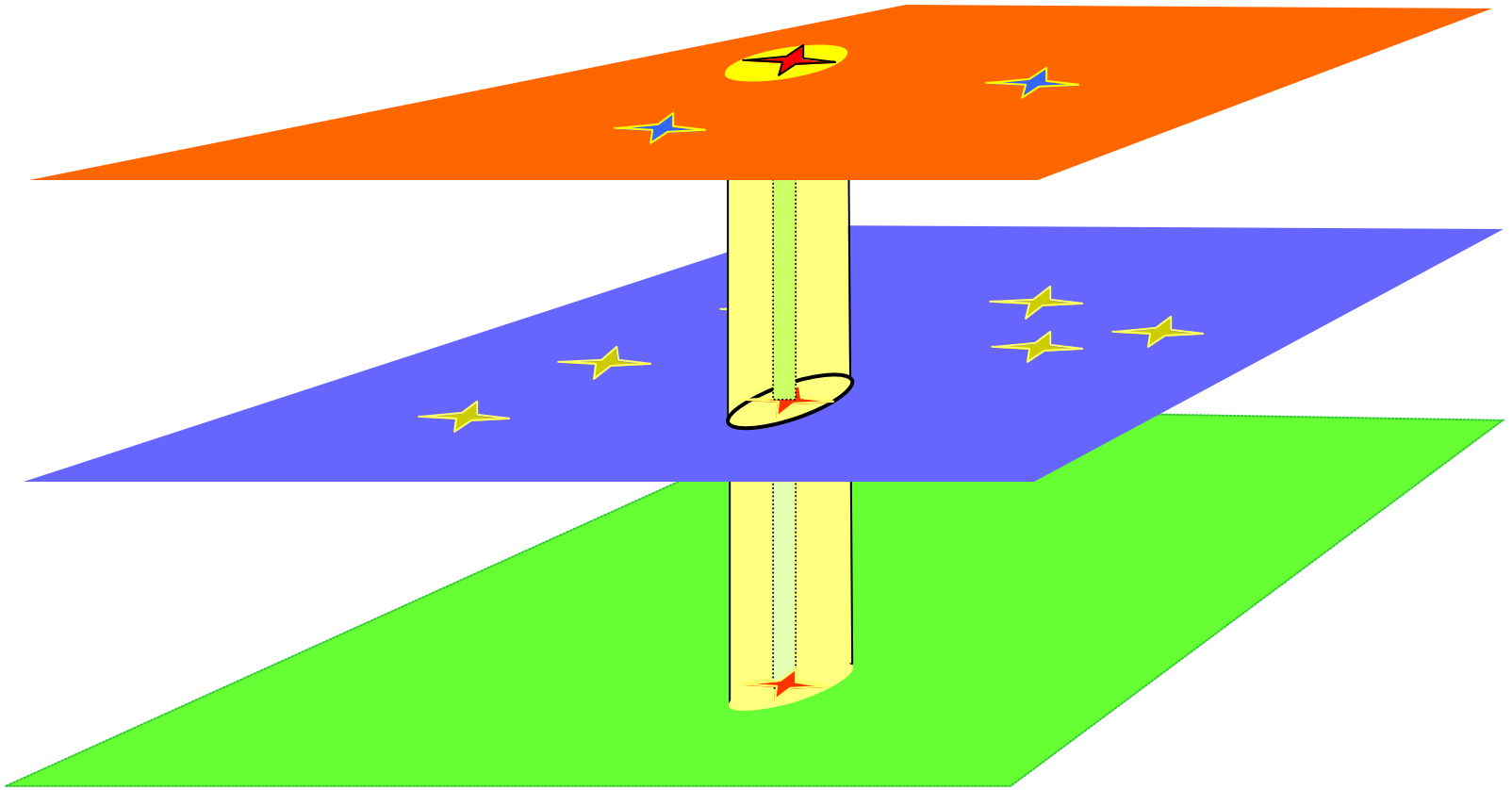
- Flexible & Robust (via multiple links)
- Real-time Sensor-to-Shooter Data for Time Sensitive Targeting

TES-A has been Linking the Sensor Grid …



… to Find and Nominate 'Targets' to C2 Grid

…C2 Grid Should Complete the Chain



C2 Grid Accepts Target, Assigns to Shooter, and Creates Time Sensitive Targeting Sensor-to-Shooter ‘Data Channel’

Which "Architecture"… ?

- Operational Architecture (What the user does with the system…
  …and what the system does for the user)
  - **Defines functional *users operational needs*… provides processing and information exchange requirements required to evolve the technical and systems architectures. The operational architecture is part of the functional component.**

- System Architecture
  - **Defines *system capabilities* required to: (1) satisfy processing and information exchange requirements based on the operational architecture and (2) comply with time-phased guidance based on the technical architecture. This architecture is part of the technical component.**

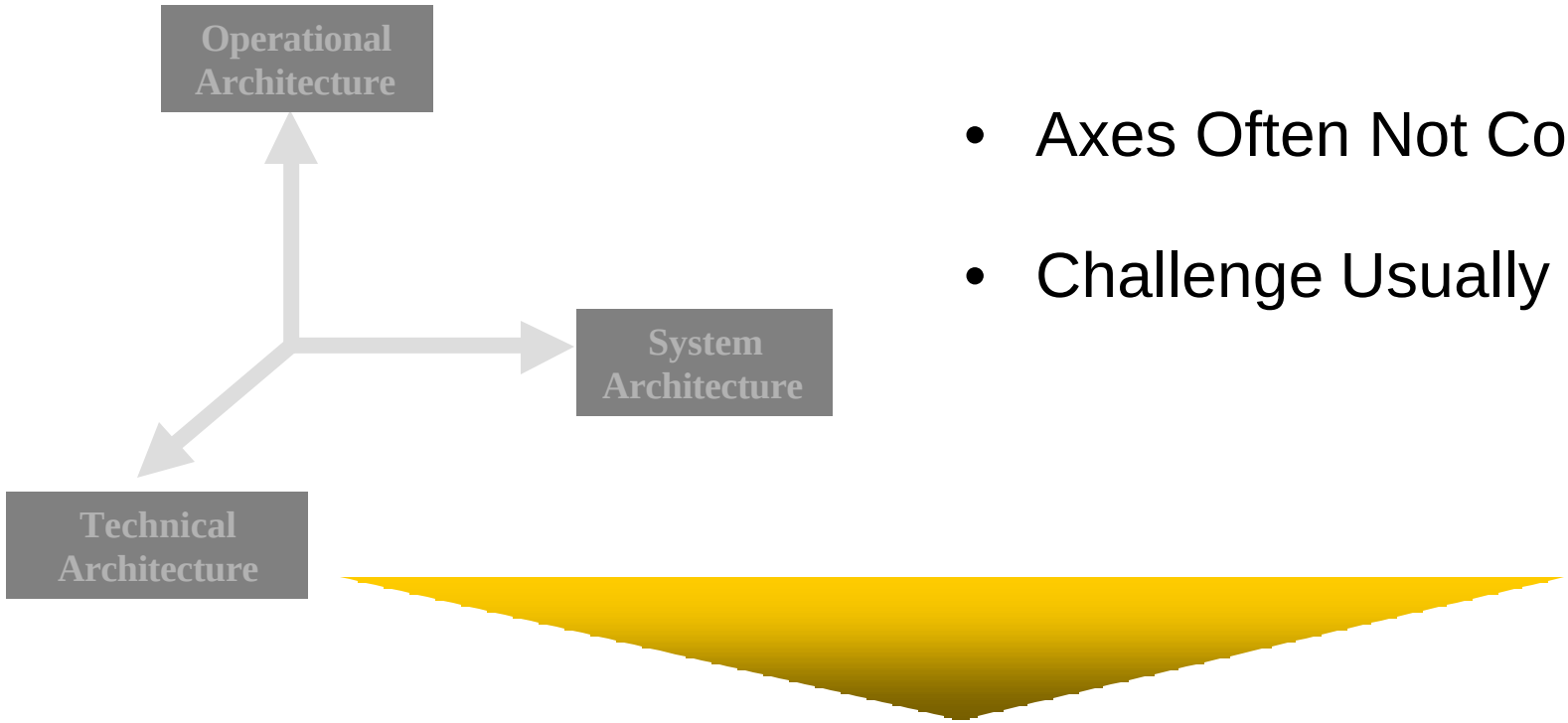
- Technical (Compliance standards imposed on the system)
  - **Identifies *standards and conventions* that can be applied across functions and systems. Standards are selected and profiled based on the processing and information exchange requirements reflected in the operational architecture and the technology reflected in the System Architecture.**

Which “Architecture”… ?

- Who cares about Operational Architecture
  - **Users / Warfighters** **(…Use them)**
  - **Contractors** **(…Define them to include their products)**
- Who cares about System Architecture
  - **Gov Program Offices** **(…Buy them)**
  - **Contractors** **(…Build / Sell them)**
  - **SETAs etc** **(…Evaluate them)**
- Who cares about Technical Architecture
  - **Gov Acquisition Offices** **(…Select which ones to specify)**
  - **Labs** **(…Fiddle with them)**
  - **Contractors** **(…Comply with them)**
  - **All** **(…Argue about them)**

"Goodness" Measured on Multiple Axes

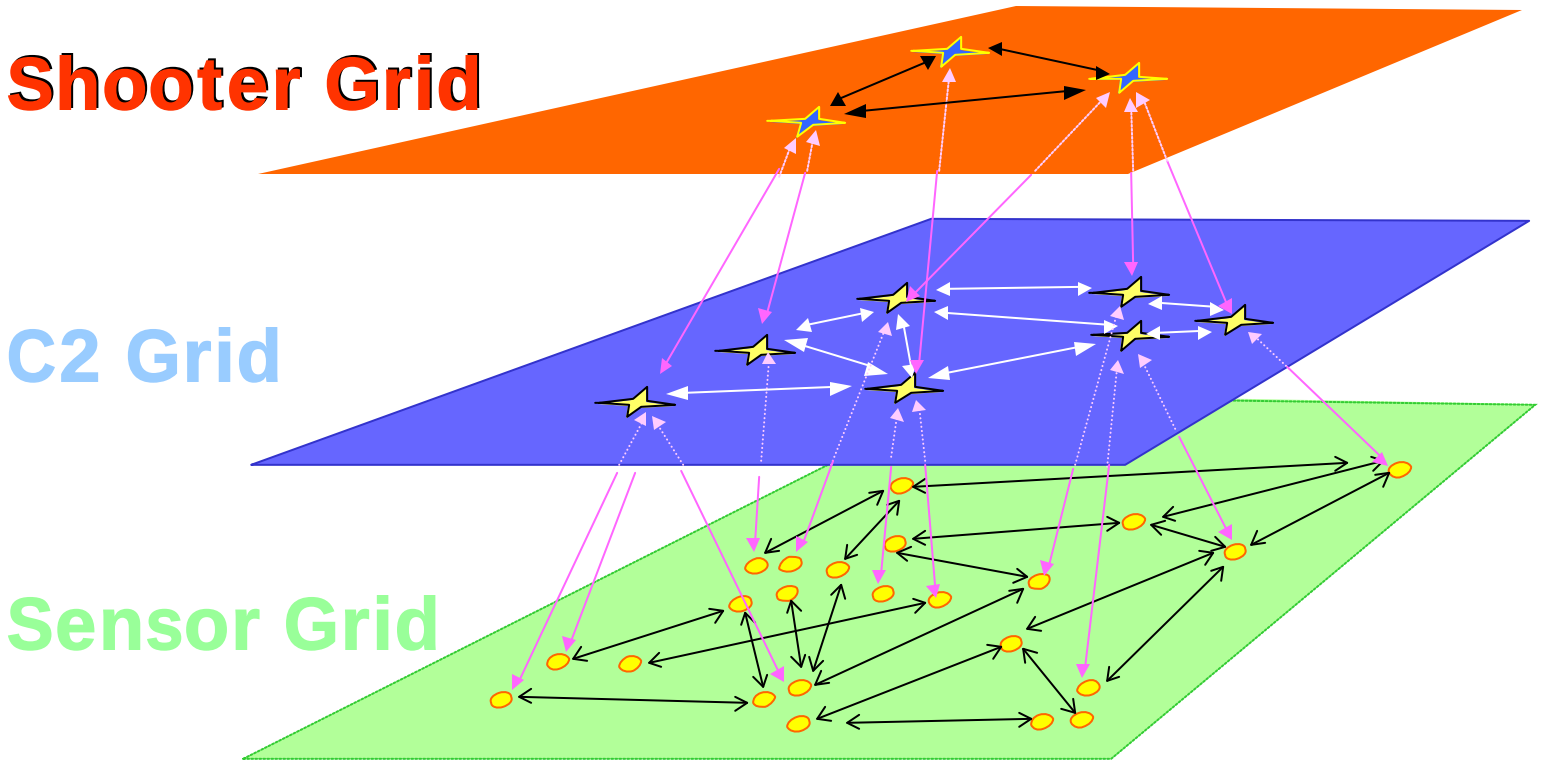
Notional Framework



- Axes Often Not Collinear
- Challenge Usually Social

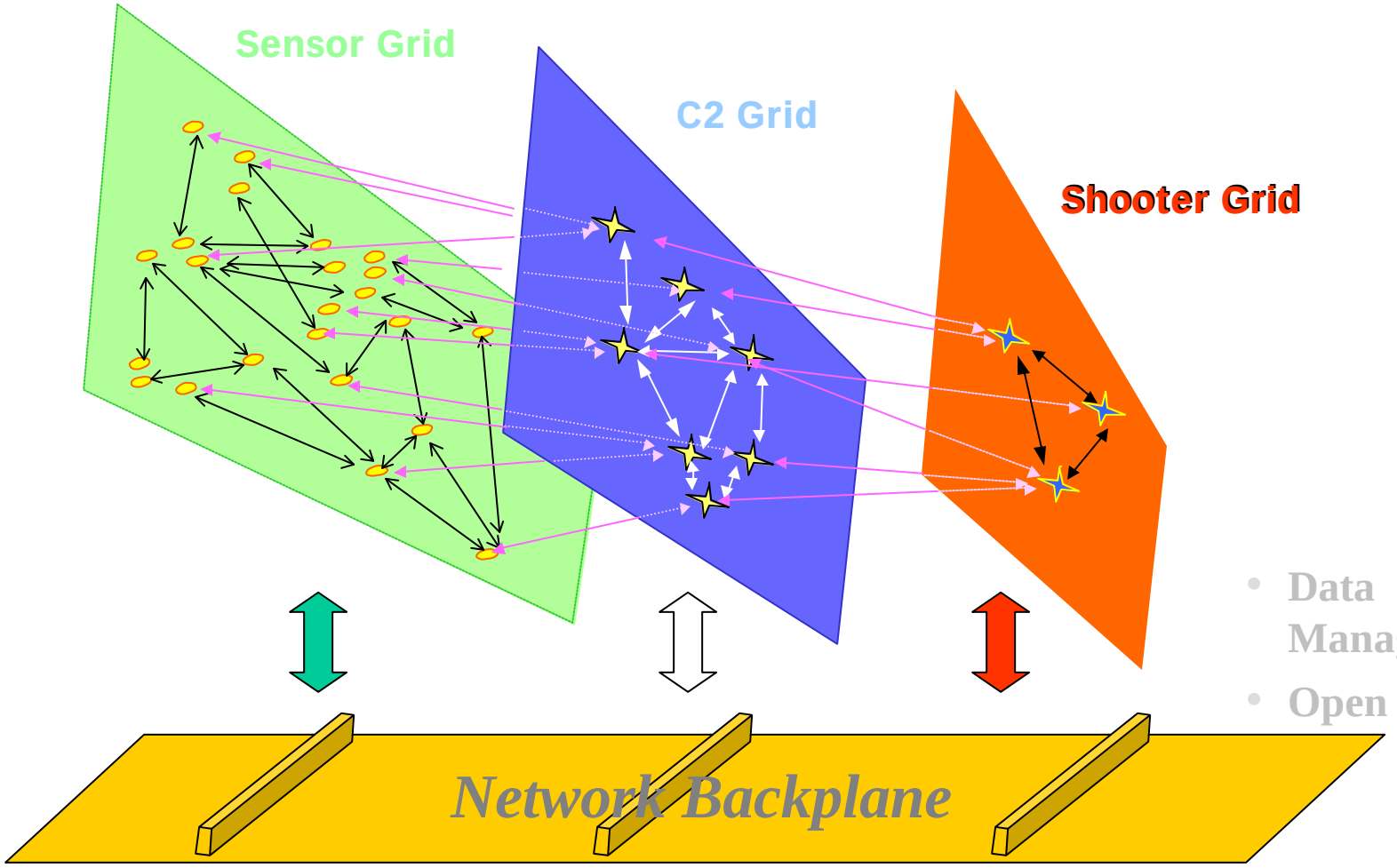
Faced with competing constraints, our focus should be on the user.

“Network-Centric Warfare” Grids (Cebrowski, Stein, Gartska)



Enabling Inter-Grid Communications

- Facilitates integration at the operational user level (not the developer level)



- Data Management
- Open API

Way Forward…

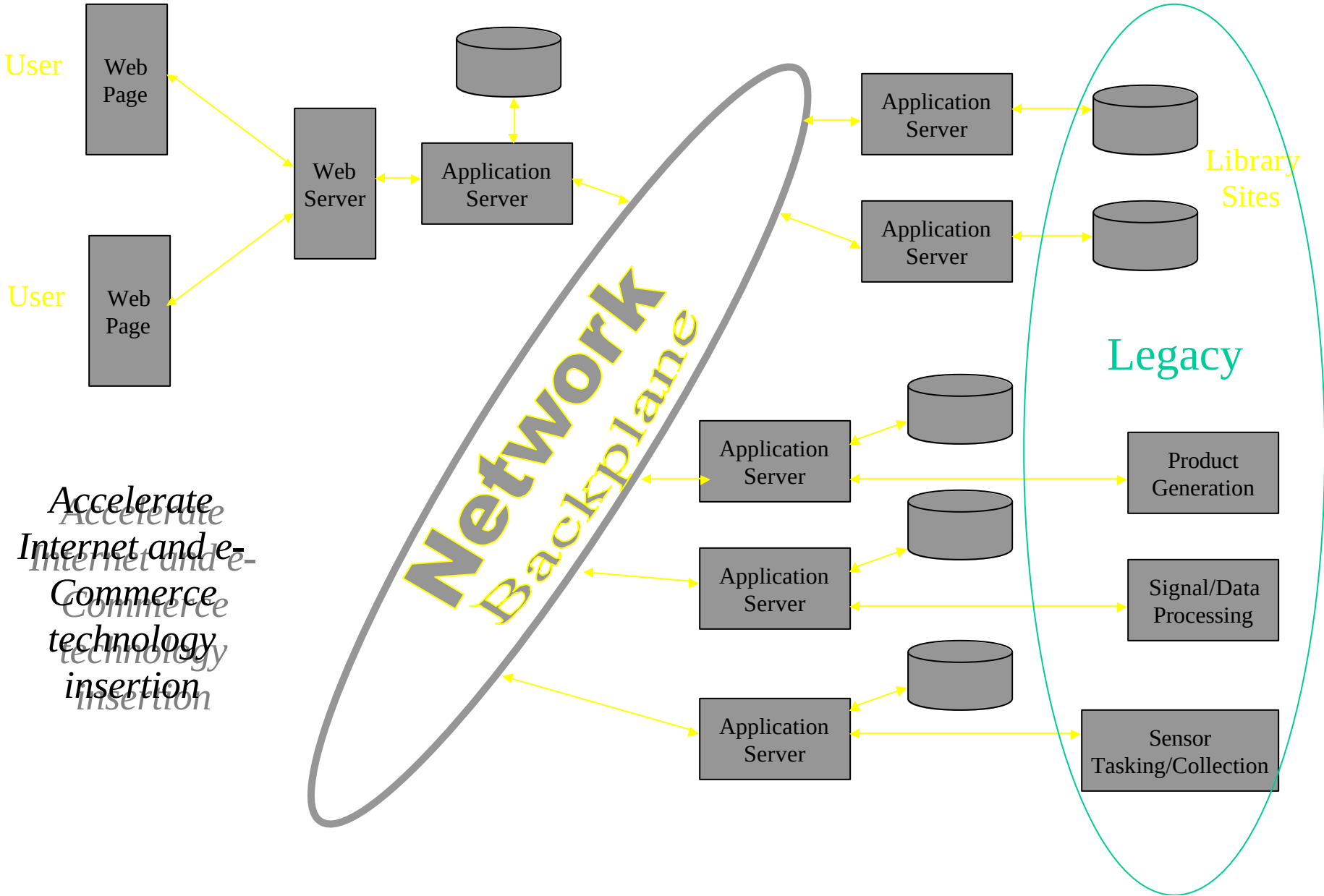
- Finish Networking the Sensor Grid
  - Diverse Multi-INT Sensors Covering Battlespace
    - Enhanced Target Detection, Identification and Geolocation
    - Enhanced Human Multi-INT Exploitation *(e.g., Self-detecting wide area sensors (SIGINT, MTI, UGS) cueing image exploitation for ID and precise location)*
  - Flexible and Timely Tasking/Retasking/Cross-Cueing
    - Wide Area Sensors Cueing Focused High Fidelity Sensors
    - Multi-INT Negation of Enemy Camouflage, Concealment and Movement
- Decouple Legacy C2-Sensor Grid Stovepipes
  - Push ISR Correlation/Exploitation into Multi-INT Sensor Grid
  - Optimize C2 for Real-time Evaluation of Sensor Grid Nominations
- Complete Networking the C2 Grid
  - Enable Joint Service COP
  - Improve Real-Time Support to Commander's Decision Process
  - Provide Dynamic Control of Sensor-to-Shooter Operations

Conclusions

- TES-A Time Sensitive Targeting Capabilities Will Drive Doctrine
  - Seamless Sensor Grid
  - Rapid Sensor Support to C2
  - Multi-INT
  - Shared Sensors and Closed-loop Sensor Tasking
  - Sensor-to-Shooter
- TES-A Framework Can Integrate Emerging Sensors
  - MP-RTIP
  - JSF
  - Theater Downlink / Space-Based Radar
- TES-A Component is Creating Joint Interoperability (JFN?)
  - Common Software Baseline Across All Services
  - Demonstrated Multi-Service Collaborative Targeting
  - Enables Common Multi-INT Sensor Picture
  - Provides Basis for SIGP…….FIOP!!

Back-Up

'Web-centric' Example of Network Backplane



Expanded Grid Representation